

References

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Appendix A: Project Descriptions

Seaboard Lumber Aquatic Habitat Restoration Project

Site Location

The habitat project is on the site of the former Seaboard Lumber Mill that operated until the 1980's, on the west shore of the Duwamish River at river mile 2. The project is in the vicinity of Kellogg Island, the last natural oxbow of the Duwamish Waterway, the adjacent Terminal 107 restoration and park area, and the Duwamish greenbelt. The site is comprised of approximately 5.7 acres of upland and 11 acres of intertidal and subtidal areas.

Condition Prior to Habitat Restoration Project

Historically, the upland site was a marsh/channel of the Duwamish River. The site has a history of diverse industrial uses. Site investigations identified various fill materials, contaminated fill, dredge waste sand and silt, and debris, including concrete, asphalt blocks, and metal debris. The site included a storm drain easement owned by Holland America, on the upland portion of the adjacent upland parcel, and only minor areas of vegetative cover comprised of invasive species and no trees. Approximately 248 creosoted wooden pilings were located in the submerged area of the site.

Site Preparation

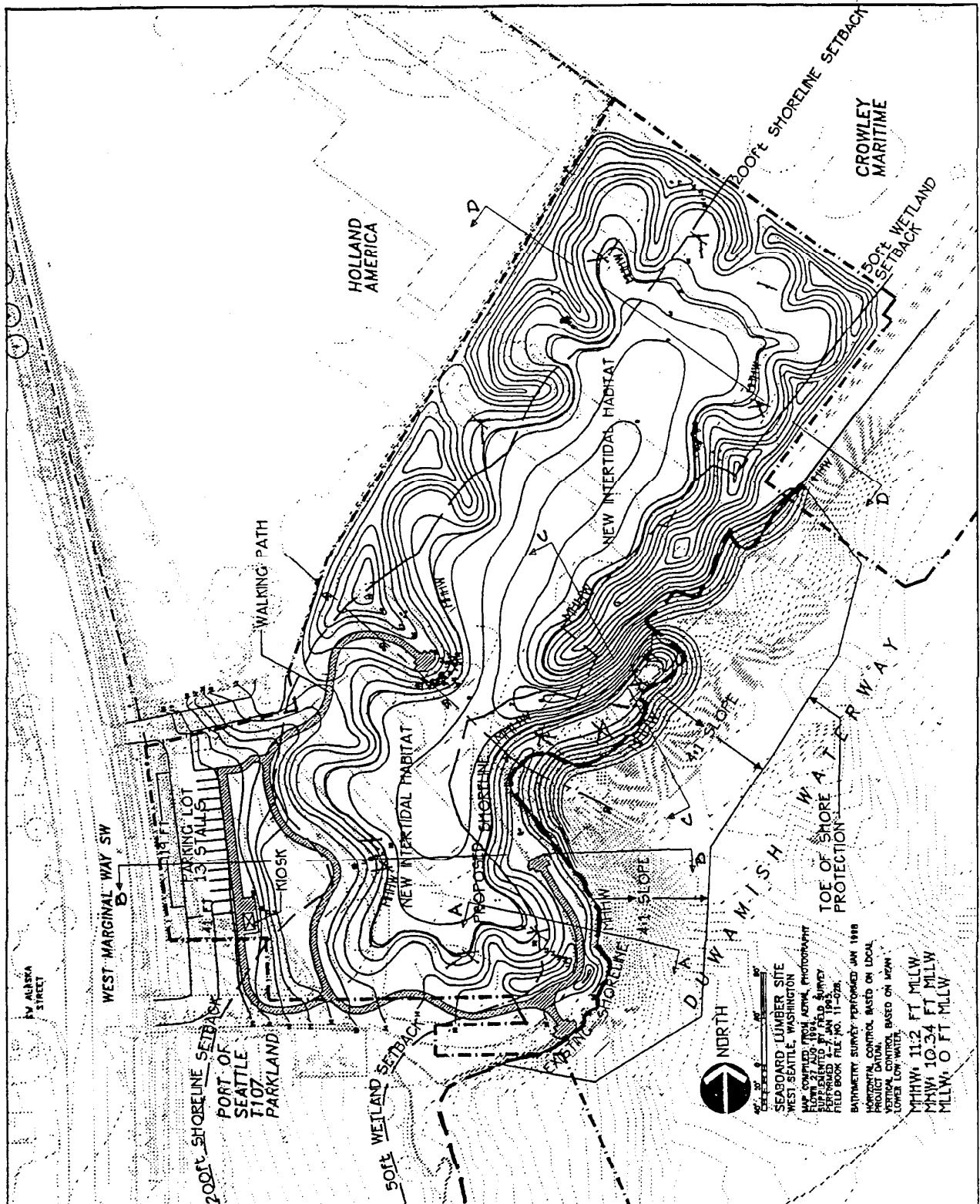
Activities completed to insure suitability of the site for habitat development included the demolition of former structures associated with the mill operation; removal of a 9200 sq. ft. shoreline dock structure, including the supporting piles, decking hardware, concrete foundations, areas of paving and partially buried railroad spurs; and removal and disposal of soils with concentrations of TPH, lead, mercury, and polycyclic aromatic hydrocarbons (PAHs) that exceed the Washington State Model Toxics Control Act Cleanup criteria. A cultural resources assessment was conducted.

Project Design and Implementation

Activities included the excavation of a 1.8 acre intertidal bay designed with a curvilinear edge to elevations between +6 to +12 feet MLLW protected by two armored spits forming a mouth opening to the Duwamish River; distribution of an amended on-site soil mixture of silts and clays with high organic content to a depth of 18 inches over the basin; planting of slopes of the intertidal area with various emergent marsh plants at various elevations and the introduction of transitional scrub/shrub habitat between the intertidal marsh, upland meadow and forested habitat.

Habitat Project Goals

Objectives for the site include the following: Maximizing intertidal habitat, creating a low wave energy environment, providing a perimeter buffer of upland vegetation, removing and containing site contaminants, and protecting the Duwamish River from exposure to on-site soils at the shoreline that contain residual concentrations of chemicals. Secondary objectives include opportunities for passive recreational use and environmental education.



PROPOSED:
INTERTIDAL MARSH CREATION
WITH VIEWPOINTS
IN: CITY OF SEATTLE
AT: SEABOARD LUMBER SITE
COUNTY OF: KING STATE: WA
APPL. BY: SEATTLE PARKS +
RECREATION
DATE: JANUARY 30, 1998
FIGURE: 4 OF 12

CITY OF SEATTLE
DEPARTMENT OF PARKS
AND RECREATION
3811 SECOND AVE. 4TH FLOOR (664-7931)

FACILITY TITLE
SEABOARD LUMBER
AQUATIC HABITAT RESTORATION

PURPOSE:
FISHERIES HABITAT ENHANCEMENT,
PUBLIC VIEWING + EDUCATION
DATUM: MLLW=0.0 (N.O.S.)
ADJ. WATERFRONT PROPERTY OWNERS:
HOLLAND AMERICA, PORT OF SEATTLE,
+ CROWLEY MARITIME

PREPARED BY:
Lee/Brennan Associates
E C G International Inc.

Hamm Creek Aquatic Habitat Restoration Project

Site Location

The restoration site is an irregularly shaped 6.2 acre parcel of land in the general area known as the Turning Basin Number 3, near River mile 6 on the west bank of the Duwamish River. It is within a 21.5 acre area of grassy field bounded to the south by Seattle City Light's Duwamish substation, to the north by Delta Marine Industries facilities, to the east by the Duwamish Waterway, and to the west by West Marginal Way South and Highway 99. Hamm Creek, confined to an open ditch, runs along the west boundary of the property.

Condition Prior to Habitat Restoration Project

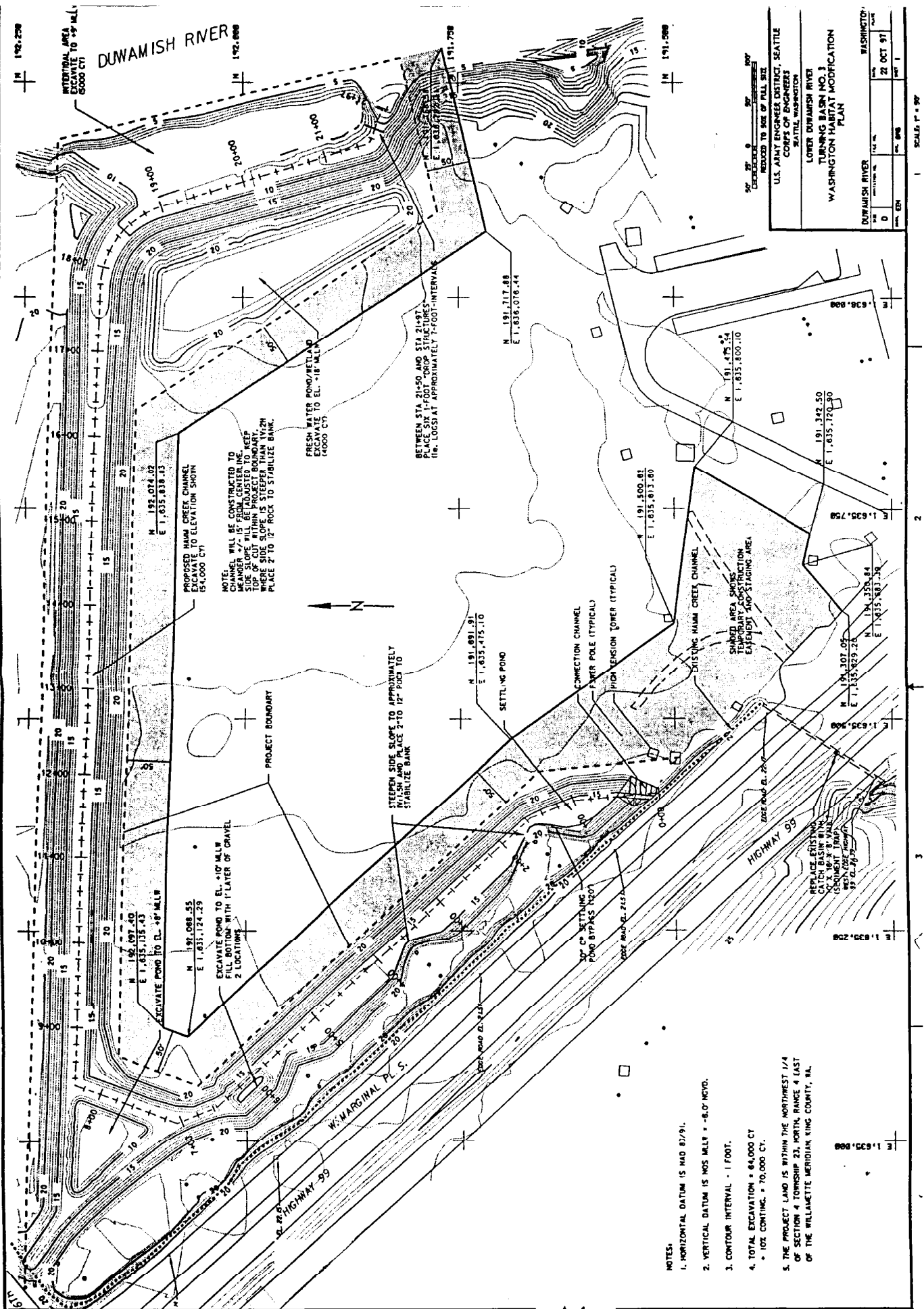
Historically, Hamm Creek meandered through an intertidal marsh within the project as it made its way to the Duwamish River. From the early 1950's through 1971, the site was used as a dredged material stockpiling area. Consequently, Hamm Creek was "placed" in a ditch and routed into a culvert with an outfall into the Duwamish River accessible to fish only at higher tides.

Project Implementation Activities

Together with the Army Corps of Engineers under Section 1135 funding, King County DNR is creating 1,900 feet of new productive riparian stream bed and channel for Hamm Creek which borders the northern and eastern portions of the site. Design features of the more natural channel includes meanders, fish pools and large woody debris. Native trees and shrubs forming a riparian buffer are to be planted on the upper slopes of the bank. The Panel contributed to the purchase of real property, design, construction, and monitoring of one acre of estuarine marsh to be created on the east side of the creek in the vicinity of the connection to the river.

Habitat Project Goals

Objectives for the site include a combination of freshwater and tidal wetland restoration as well as stream and riparian corridor improvements for the lower reach of Hamm Creek.



Hamm Creek Site Plan

Turning Basin No. 3 Aquatic Habitat Restoration Project

Site Location

The project site is located on the former Kenco Marine Services (Kenco) property at the western upstream boundary of the maintained navigation channel at Turning Basin No. 3 of the Duwamish River. The .82 acre parcel is bordered on the western edge by West Marginal Way South. City Light Duwamish Substation property is to the North, and Coastal America and Port of Seattle mitigation projects are to the south of the parcel. The .82 acre parcel includes uplands and intertidal mudflats.

Condition Prior to Restoration Project

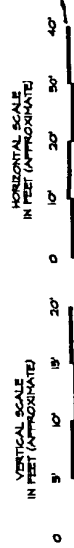
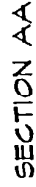
The upland portion of the site is at an elevation of +15 feet and is primarily a peninsula composed of fill material, with a commercial pier extending approximately 125' into the Turning Basin. The upland area is covered with asphalt and concrete pads, in addition to an office/warehouse structure, small storage sheds, and a house. The property is steep sloped. Prior to purchase, barges and other vessels were moored in the intertidal and subtidal area. Project implementation activities include removing existing commercial structures and recontouring and revegetation the area to provide an enhanced intertidal estuarine wetland area. "Benches" will be created at various elevations. A "lower bench" at elevation +2 to +6 feet, at a 10:1 slope of sand over 3/4" gravel substrate will create 6,500 sq. ft. of habitat. "Soft" substrates (wood) will be used at the transition to the emergent zone bench. An "emergent zone bench" at elevation +9.5 to +11 feet, at a 20:1 slope planted with native intertidal vegetation and random rock placement will create 6,050 sq. ft. of habitat. A "groundcover and shrub zone bench" at elevation +14 to +17 feet, at a 3:1 slope planted with native riparian vegetation will create 1,850 sq. ft. of habitat. Upon purchase of the property, the removal and prohibition against moorage of barges and other vessels exposed 16,000 - 18,000 sq. ft. of intertidal and subtidal mudflats.

Habitat Project Goals

Objectives for the site include significant gains in intertidal and subtidal mudflats through prohibitions of moorage and an enhanced intertidal estuarine wetland area through the creation of benches.

This topographic map shows a property boundary with various contour lines and elevation markers. The map includes the following features:

- Property Boundary:** Indicated by a dashed line on the left side of the map.
- Old Barge:** A rectangular area labeled "OLD BARGE" is shown in the upper left corner.
- Contour Lines:** Numerous contour lines are drawn across the map, with numerical values such as 10, 12, 14, 16, 18, 20, 22, and 24.
- Elevation Markers:** Specific points are labeled with elevations:
 - "LOWER BENCH AT ELEVATION 13 TO 16 (SAND AND GRAVEL) 6000 SQ FT"
 - "EMERGENCY ZONE BENCH AT ELEVATION 14.5 TO 16 6050 SQ FT"
 - "GRASS COVER AND ELEVATION BENCH AT ELEVATION 14 1050 SQ FT"
- Scale and Orientation:** A scale bar at the bottom indicates distances in feet (0, 20, 40, 60, 80). A north arrow points towards the top of the map.
- Other Labels:** The map also includes labels for "PROPERTY LINE", "RIP", "EP", and "CA".



North Wind's Weir Aquatic Habitat Restoration Project

Site Location

North Wind's Weir is on 3.1 acres of land south of the Duwamish Waterway Turning Basin No. 3, upstream of the navigable waterway on the west bank of the Duwamish River at approximately river mile 7. Panel funds were used to purchase a 1.03 acre parcel of the property to conduct habitat restoration activities.

Condition Prior to Habitat Restoration Project

Converted from natural area to "improved industrial land," the site was developed in the 1930's and 1940's for single family residential housing. Residential structures were subsequently removed from the site. A step bank along the river right-of-way slopes downward (almost vertical) approximately 20 feet to the riverbed. The shoreline is riprap in the lower intertidal to subtidal areas. Coniferous and deciduous trees and shrubs are on the upland portion of the property.

Project Implementation Activities

The Panel's intertidal habitat project will be complemented by upland improvements to be undertaken by King County, including trails, shoreline stabilization, plantings, and interpretive features highlighting the cultural significance of the site to Native Americans. A cultural resource assessment was undertaken in 1996. A 1.03 acre intertidal basin is scheduled for construction in the year 2000. The intertidal habitat will be excavated from an elevation of +6 to +15 feet MLLW. It is designed with a curvilinear edge to create a more natural appearance and to maximize habitat diversity at the edge zone. Connection to the Duwamish River will be at the northeast end of the property, achieved by using natural bank slopes stabilized with vegetation. The "softer" engineering approach will allow a more natural stabilization process to occur at the site. Upland edges are to be revegetated with native trees and shrubs to form a riparian buffer designed to incorporate as many mature coniferous trees and native shrubs present on the site as possible.

Habitat Project Goals

The new intertidal habitat will assist migrating salmonids to acclimate on their downstream passage, stabilize the shoreline, and improve riparian conditions. Secondary objectives of King County's upland work include opportunities for passive park use, bicycle trail access, and environmental education.

Appendix B: Estimation of Resources Required for Monitoring Plan Implementation

Intertidal Area

Approach

1. Use GPS to map +12'MLLW contour at each project site.
2. Use physical survey methods (laser level) to generate cross section profiles, preferably along same permanent transect lines used to evaluate vegetation.
3. Acquire digital aerial photographs of project sites and incorporate into GIS database.
4. Create GIS data layer from contour and cross section data.

Resources Required

Initial

1. 1 Biologist-day (engineer) and 1 Technician-day per site to establish +12 benchmark.
2. 1 Biologist-day and 1 Technician-day per site to establish permanent transect locations for each site.

On-going

1. 0.5 Technician-day per site to acquire GPS data (+12' wetted area perimeter).
2. 0.5 Technician-day x 2 per site to acquire cross section data
3. 1.0 Technician-day per site to download GPS and survey data, incorporate into GIS.
4. Acquire low tide digital aerial photos (contract; \$2500/event year)
5. 2.0 Biologist-day (GIS specialist) per event year to upload aerial photo data and assist with georeferencing
6. 2.0 Technician-day per event year to create maps from GIS data

Tidal Regime

Approach

1. Acquire and install continuous recording, pressure transducer type water level loggers
2. Download water level data on a monthly basis

Resources Required

Initial.

1. Purchase water level loggers for enclosed basin type restoration sites (3 @ \$795)
2. 0.5 Biologist-day (engineer) and 0.5 Technician-day per site to install and survey elevation of water level logger

On-going

1. 1.0 Biologist-day per month to download data from all three water level loggers

Slope Erosion

Approach

1. Establish one or more appropriate photo point locations at each site for evaluating slope erosion
2. Conduct quarterly visual inspections of sites for evidence of slope erosion, and photograph site from established photo point(s)
3. Increase frequency of observations, if possible, with use of volunteers

Resources Required

Initial

1. 1 Biologist-day and 1 Technician-day to establish photo point locations at all four restoration project sites

On-going

1. 1 Technician-day per quarter to complete inspection and photography at all four sites
2. Photographic supplies; \$100 per event year

Sediment Structure

Approach

1. Collect six sediment cores (3 each within two different sampling areas) at each site in areas where epibenthic invertebrate are sampled.
2. Using nested sieves, analyze sediment samples in lab for sediment grain size.
3. Using standard methods, analyze sediment samples in lab for organic content.

Resources Required

Initial

none

On-going

1. 0.5 Technician-day per site to collect sediment samples
2. 1.0 Technician-day per site to complete grain size analysis
3. 1.0 Technician-day per site to complete organic content analysis

Sediment Quality

Initial

1. Install two groundwater wells at Seaboard Lumber site – \$6500
2. Groundwater sampling once per quarter for one year – \$6500
3. Well closure; pull casings and fill holes with bentonite – \$1000

On-going

none

Marsh Vegetation

Approach

1. Identify specific sampling locations at each of four project and two reference sites.
2. Using digital aerial photos or GPS methods, delineate areas of marsh vegetation cover
3. Using permanent transects and quadrat sampling methods, assess areas of intertidal vegetation for:
 - a. Species present
 - b. % cover by species
 - c. Stem height
 - d. Shoot density

Resources Required

Initial

none - transects previously established under "intertidal area" tasks

On-going

4. 0.5 Biologist-day and 1.5 Technician-day per site to delineate extent of vegetated area
5. 1 Technician-day and 1 Biologist-day per site to complete transect data collection

Riparian Vegetation

Approach

4. Using digital aerial photos or GPS methods, delineate areas of riparian vegetation cover
5. Using permanent transects, assess percent survival of plantings, and percent cover for:
 - a. Herbaceous layer
 - b. Shrub layer
 - c. Tree layer
 - d. Non-native species

Resources Required

Initial

none - transects previously established under "intertidal area" tasks

On-going

1. 0.5 Technician-day per site to delineate extent of riparian vegetation cover
2. 0.25 Biologist-day and 0.5 Technician-day per site to complete transect data collection activities

Bird Use

Approach

1. Establish observation points or routes in 2 larger project areas
2. Monitor bird use within the two areas on a quarterly basis, one morning and one evening each per area per quarter. Note species observed and category of behavior
3. Increase frequency of observations, if possible, with use of volunteers

Resources Required

Initial

1. 1 Biologist-day and 1 Technician-day to establish observation areas

On-going

1. 2 Technician-day per quarter to monitor bird use (one @ AM & PM session in two areas)

Fish Access

Approach

1. Identify specific sampling locations at each of four project and two reference sites.
2. Sample each site once every two weeks during the period of juvenile salmonid sample outmigration (1 March to 15 June) using block and/or beach seine methods
3. Identify and count fish captured
4. Collect fork length data on subsample of juvenile salmonids (apx. 25 individuals/spp/sample event)
5. Consider using non-lethal methods to collect stomach contents for diet studies
6. Release all fish unharmed

Resources Required

Initial

1. 1.0 Biologist-day and 1.0 Technician-day per site to determine sampling gear and methods

On-going

1. 1.0 Biologist-day and 1.0 Technician-day per site x 8 sampling events per sampling year

Prey Resources Production

Approach

1. Identify specific sampling locations at each of four project and two reference sites.

2. Using floating traps, collect "fallout insects" monthly during the period of juvenile salmonid sample outmigration (1 March to 15 June)
3. Using core sample techniques, collect benthic invertebrates monthly during the period of juvenile salmonid sample outmigration (1 March to 15 June)
4. In the laboratory, identify invertebrates to lowest taxonomic group possible (use previous Duwamish monitoring studies as guide)

Resources Required

Initial

1. 1.0 Biologist-day and 1.0 Technician-day per site to determine sampling locations

On-going

1. 1.0 Technician-day per site per month to collect both fallout and benthic invertebrate samples
2. 16 Technician-day per event year to analyze fallout insect samples
3. 16 Technician-day per event year to analyze benthic invertebrate samples

Reporting

Resources Required

1. 10 Biologist-day and 20 Technician-day per event year for data entry and analysis
2. 10 Biologist-day and 10 Technician-day per event year for report preparation
3. 5 Technician-day per event year for report revision and distribution